MINAR International Journal of Applied Sciences and Technology
ISSN: 2717-8234
Article type: Research Article

Received: 08/04/2023 **Accepted:** 30/04/2023 **Published:** 01/06/2023

RETUSA CANALICULATA (SAY,1822) AS A SEDIMENTARY ENVIRONMENTAL INDEX FOR SAND DEPOSITS IN THE IRAQI COAST

Bushra Majeed ISSA[1]

University of Basrah, Iraq

Abstract

The aim of the research is to determine the sedimentary environment and estimate the geological period of the rocky islands (solidified sand deposits) and shoals in the Iraqi coast, by studying a type of gastropod class known to be present in the region, which is *Retusa canaliculata* (Say,1822). Only eight sand sediment samples were used for this purpose. The particle size distribution showed that sediment was formed of Clayey sand, Silty sand, sand and Muddy sand. By checking the species *Retusa canaliculata* (Say,1822) in the sandy samples, it was observed that the percentage of species individuals increased with the rise in the percentage of sand in the samples. From the shells nature of the individuals of this species, their age is probable to date back to the late Holocene period (less than 4,000 years ago). Which means that the solid sandy sediments were within the aforementioned period, where the estuarine environment was, which represents the ideal environment for the species *Retusa canaliculata* (Say,1822).

Keywords: *Retusa canaliculata* (Say,1822), Iraqi coast, Rocky islands, Late Holocene, Southern Basrah, Estuarine environment.

http://dx.doi.org/10.47832/2717-8234.15.1

[1] bushra.issa@uobasrah.edu.iq

Introduction

The far south of Basra represents the Iraqi coast, which is characterized by the tidal flats of Khor Al Zubair and Khor Abdullah, where the influence of the surrounding conditions, whether marine or river, appears in them, as well as the sediments exposed there, some of these deposits date back to the Quaternary period and others to the sediments of the Tigris and Euphrates (Issa,2006).

The Iraqi coast extends between the western side of Ras Al-Bishah and the eastern side of Khor Al-Zubair, where the latter channel connects to Khor Abdullah via Khor Shettana.

In Khor Al Zubair, small rocky islands appear to the northern part of it, where their presence was explained as a result of the complex hydrodynamic conditions in the region (Wasel and Albadran, 2003).

While Hacham Island appears in the southern part of Khor Al Zubair, which is the largest in size compared to the previously mentioned islands and the reason for its formation has been attributed to the contribution of tectonic, morphological and sedimentary factors (Al-Mosawi *et. al*, 2022).

As for Khor Abdullah, it was distinguished by the appearance of shoals at its southern entrance from the side of the Arabian Gulf, where it was suggested that they formed during the Holocene period when the sea level regression(Albadran and Issa, 2011).

Materials and Methods

Eight samples in which sand content is expected to high were collected from four different locations, with depths ranging from 20 to 90 cm; From rocky islands in Khor Al Zubair, Hacham Island, rocky pieces from Khor Shettana, and stiff deposits from shoals at the southern entrance of Khor Abdullah (Figure 1).

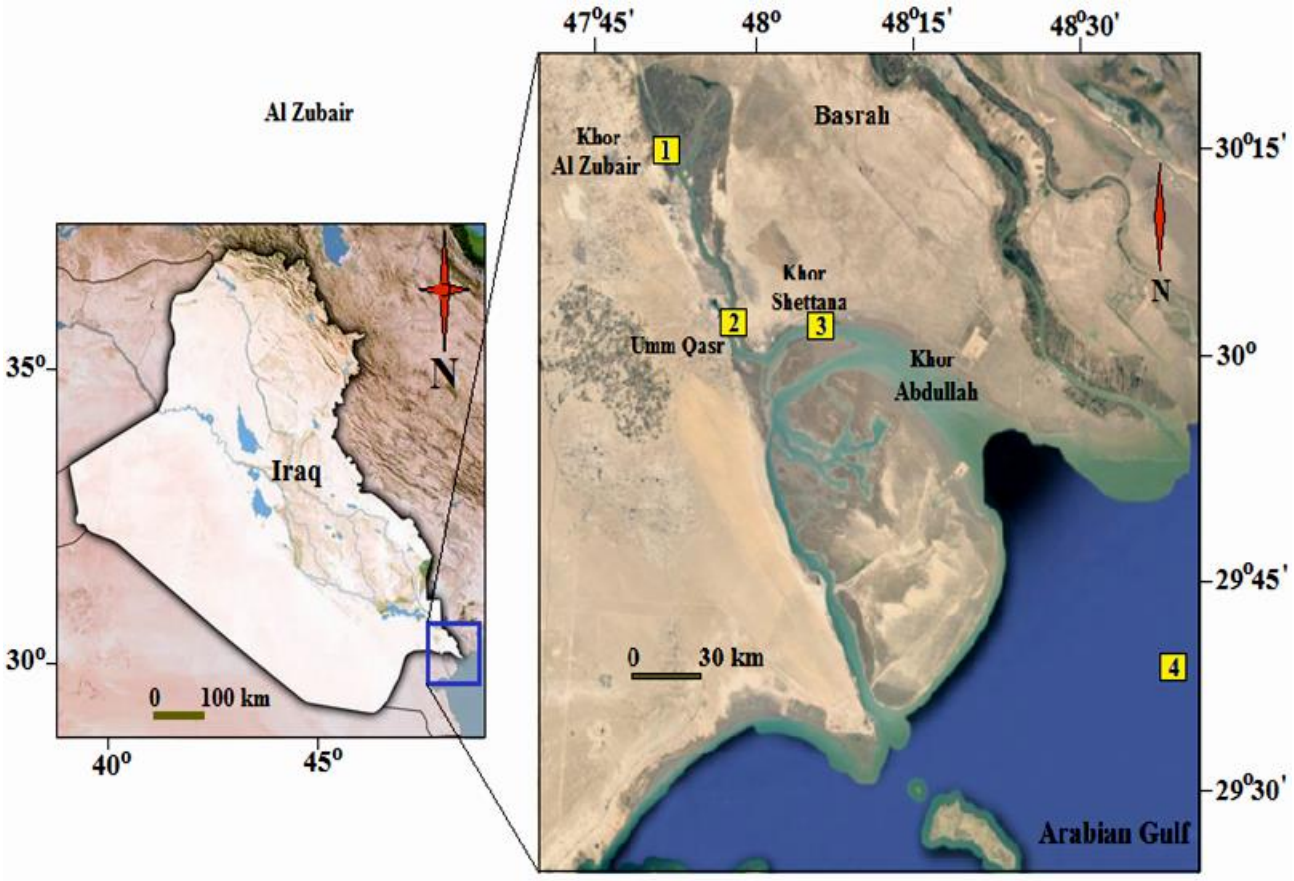
The first three sites samples were collected between 2017 and 2018. As for the samples of the last site, they were used from the models of the study of Albadran and Issa (2011).

To determine the percentage of sand, silt and clay, the wet sieving method was used to separate sand from silt and clay using a standard sieve of 230 mesh, while the Pipette method (Folk,1980) was used for silt and clay.

As for the remaining sand, it was collected and dried for the purpose of determining the shells species present in it and for this, the classification (Keen and Coan, 1974) was adopted.

Figure 1

Sampling sites map



The grain size distribution according to texture classification (Folk, 1980) showed the presence of four types (Table 1). The presence of Clayey sand predominated at 37% over the presence of other types, where Silty sand was 25% and Sand 25%, and the least common type was Muddy sand 13%. However, all types are characterized by a high proportion of sand size compared to other grain sizes.

It was observed that in the deposits of the rocky islands of Khor Al Zubair and the sediments of the shoals, although the proportion of sand is dominant, it appeared that the texture softened towards the top. In the first site, the texture moved from Sand to Muddy sand until Clayey sand at the top. As for the second site, mud was replaced by silt at the top of the site. This indicates a relative calmness in the environment, where perhaps a decrease in the speed of the water currents (Figure 2).

Table 1:

Percentage of Sand, Silt and Clay, sediment type and relative abundance of Retusa canaliculata in the sites

Name of site	Depth of sample(cm)	Sand%	Silt%	Clay%	Sediment type	*Retusa canaliculata* %
Khor Al Zubair (1)	60-70	84	2	14	Clayey Sand	21
	70-80	87	4	9	Muddy Sand	35
	80-90	91	1	8	Sand	44
Hacham Island (2)	45-55	87	10	3	Silty Sand	40
Khor Shettana(3)	35-45	96	3	1	Sand	60
Shoal(4)	20-30	70	8	22	Clayey Sand	15
	35-45	87	3	12	Clayey Sand	25
	45-55	88	9	3	Silty Sand	60

Identified Species

Fragments shells of different species were found, between molluscs and foraminifera, with a few species with whole shells. However, what attracted attention is the appearance of a species of gastropods, which is *Retusa canaliculata* Say,1822 (Figure 3). The presence of the species was associated with sandy sediments, as it was observed that its numbers increased with the raise in the proportion of sand in the sediment samples of the selected study sites (Figure 2).

The shell of the species individuals seemed solid with varying colors of white color, with the presence of some debris of shells attached to the outer surface of the shell, especially at the site of the shoals, and what was also noted is the varying size of the individuals of the species, which indicates that the species is not transported. The species *Retusa canaliculata* Say,1822 has previously been recorded in the coastal area of Umm Qasr as well as Hacham Island (Ahmed, 1973). While the appearance of this species was recorded for the first time in Khor Al Zubair within the tidal flat, where sand sediments existed (Issa, 2006).

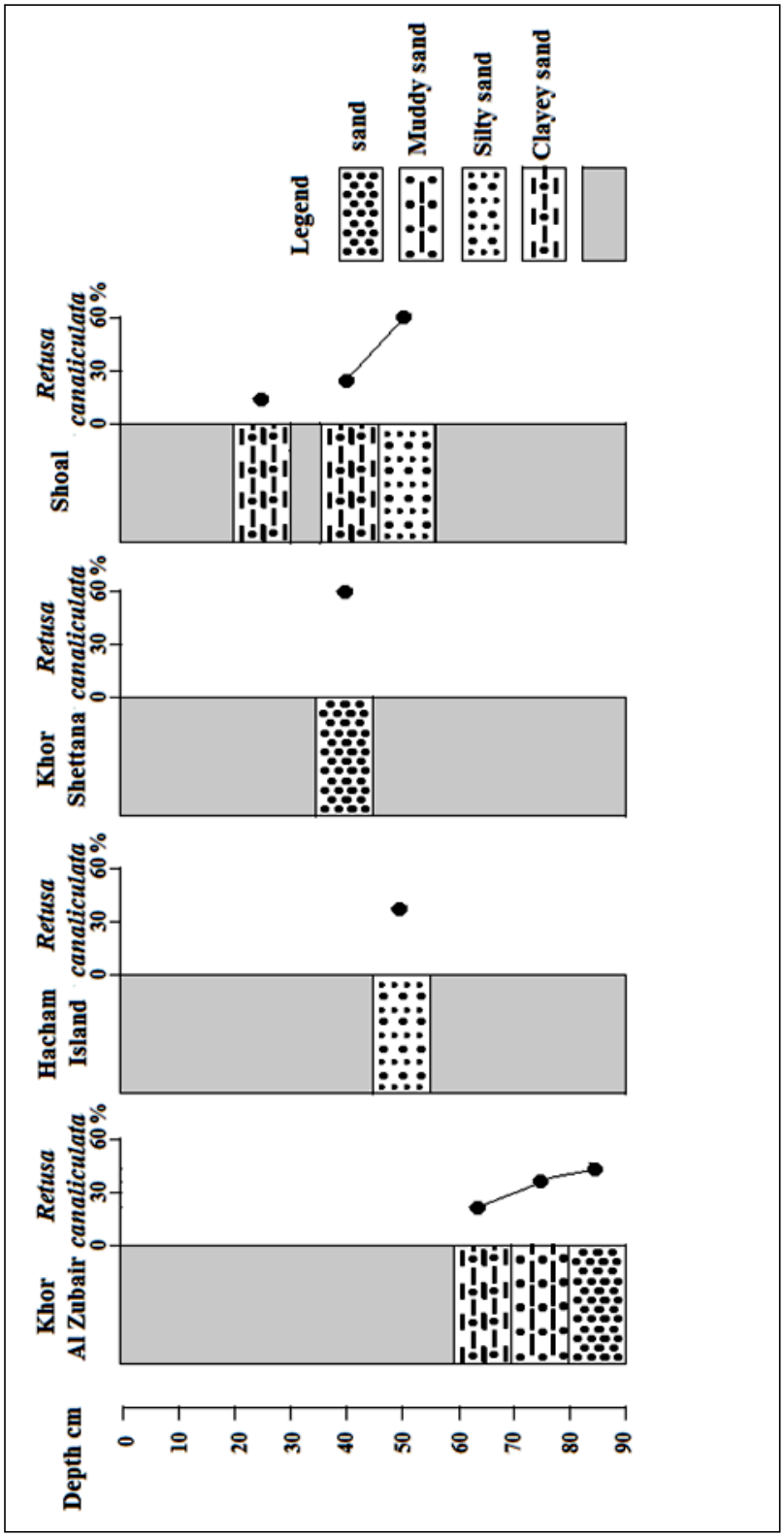
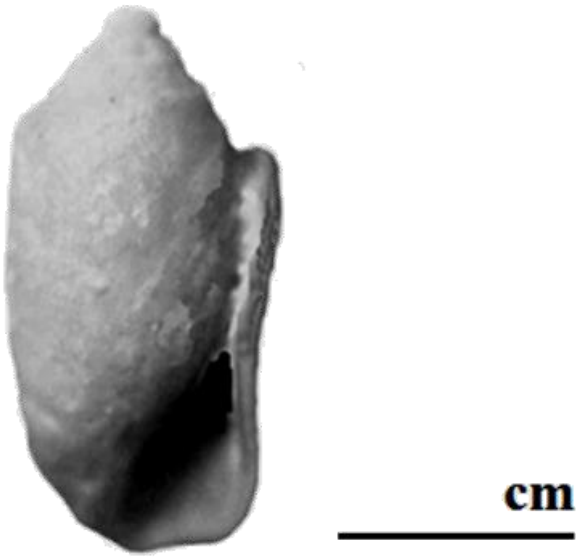


Figure 2

Relative abundance % of Retusa canaliculata in the sediment column of the sites

Figure 3

Retusa canaliculata Say,1822



Discussion

The Iraqi coast has received a large share of studies in various fields, and in the midst of all this, the different types of sediments present in it were revealed with the different sources of those sediments, with most of the studies agreeing on the combination of many factors that led to their formation.

As for the current research, the focus was exclusively on the sandy deposits that were deposited in certain locations on the Iraqi coast. The research aimed to find a relationship linking the presence of any species of specific shells with these sand deposits (Table 1), this is in order to find information about the accompanying environment during its sedimentation and to predict the geological period in which it was deposited. Thus, the adopted basis for detecting this is the species that appeared accompanying these deposits, which was identified in this research *Retusa canaliculata* Say,1822.

Harrison and Wass (1965) found that the distribution of the species is associated with a high sediment-water content. This makes this species tolerant of the environmental change in the degree of salinity, as the species appears in waters whose salinity ranges from polyhaline to euhaline (Nilsen, *et. al.*, 1982). Although this species can appear in mud deposits, the prosperity of species individuals is closely related to the presence of sand deposits (Boesch, 1971). Where this species can exist in large numbers at different depths, which reach 12 meters (Haven *et. al*, 1981) , however, the species individuals are more common in the sands sediments of estuaries and lagoons (Parker, 1960; Emerson and Jacobson, 1976). This means that *Retusa canaliculata* Say,1822 appears in the estuary area from the part where the salinity is reduced until the estuary meets open sea water.

According to the above, the species *Retusa canaliculata* Say,1822 is known in the estuarine sand environment. This means that the suitable environment for sand sedimentation in the sites of the study area is the estuarine environment, that is, the presence of a river condition accompanying the entry of marine waters. Issa study (2006) of sand deposits from the rocky body in the Khor Al Zubair tidal flats provened that they are of riverine origin. The presence of the species in sandy sediments is in itself an indication of

the estuarine environment during the sedimentation of these rocky islands. This indicates that the rocky islands and hardened sand deposits were deposited during the passage of the ancient Euphrates River in Khor Al ZubaIr, as the latter was considered its outlet at that time. The estuarine condition extended its influence to Khor Shettana until the entrance to the marine waters at Khor Abdullah.. The same applies to the shoals, which are in an environmental condition similar to that of the rocky islands in Khor Al Zubair and Hacham Island, where the species was found with external shell specifications similar to those in Khor Al Zubair.

The appearance of *Retusa canaliculata* Say,1822 in sand sediments only in a condition similar to the presence of the same species within the same sediments in the study of Nilsen *et al.* (1982) assumes that the estuarine condition is associated with the predominance of the marine environment, indicating climate change (increasing aridity).

The shell specification of the species individuals and the type of sediments found in it indicate that the most appropriate period for sedimentation of these hardened sandy assemblies is within the Late Holocene (less than 4000 years ago).

Conclusions

- All samples of the study area sites showed a high percentage of sand in its content, and the sediments were classified into four types; Clayey sand, Silty sand, Sand and Muddy sand.
- The dominance *Retusa canaliculata* Say,1822 in the sand deposits and the relative increase of its presence with the increase in the percentage of sand deposit.
- The estuarine environment is the suitable environment during the deposition of these sandy sediments.
- The geological period of sand sedimentation at the study area sites is within the Late Holocene period and is very likely less than 4000 years ago.

References

Ahmed, M. M. (1973). *Systematic Study on Mollusca from Arabian Gulf and Shatt Al-Arab*. Center for Arab Gulf Studies, University of Basrah Iraq.

Albadran, B. N. and Issa, B. M.,2011. Biofacies Study of Selected Shoals Northwest Of Arabian Gulf. *Basrah Journal of Scienec* (C), 28 (1), 37-51.

Al-Mosawi, W. M. , Al-Manssory, F.Y1, Shareef, N.F1 and Al-Humaidan, Z. A. (2022). Origin and Forming of Hacham Island in Khor Al-Zubair Channel, Southern Iraq. *Iraqi Geological Journal*, 55 (2A), 182-195.

Boesch, D. F. (1971). *Distribution and Structure of Benthic Communities in the Hampton Roads Area, Virginia*: *A Technical Ecological Report to the Hampton Roads Sanitation District Commission. Special Reports in Applied Marine Science and Ocean Engineering* (*SRAMSOE*) No. 15. Virginia Institute of Marine Science, William & Mary. https://doi.org/10.21220/V59T73

Emerson , W. K. and Jacobson , M. K.(1976). *Guide to Shells , Land ,Freshwater ,and Marine ,from Nova Scotia to Florida* .The American museum of nutural history ,Alfred K.A. New York.

Folk, R. L., 1980. *Petrology of Sedimentary Rocks*. Hemphill, Texas.

Harrison, w. and Wass M. 1., 1965. Frequencies of infaunal invertebrates related to water content of Chesapeake Bay sediments. Southeastern Geol. 6:177-187.

Haven, D. S., Kraeuter, J. N., Krauter, R. C., & Morales-Alamo, R. (1981). *An Animal-sediment study in the lower York River* : February 1965 to February 1966. Special scientific report No. 108. Virginia Institute of Marine Science, William & Mary.67 page http://dx.doi.org/doi:10.21220/m2-mrkr-mq76

Issa, B.M., 2006. *Sedimentological and Palaeontological Study of Tidal Flats-Northwest of the Arabian Gulf*.[Unpubl. M.Sc. thesis]. Basrah University.

Keen , A.M. and Coan , E. (1974) . *Marine Molluscan . genera of western north America* . Stanford University Press , Stanford , California.

Nilsen, K. J., Robert J. D. and Donald F.(1982). *Boesch, Rodney Bertelsen, and Michel Kravitz. The biogenic structure of lower Chesapeake Bay sediments*: EPA Chesapeake Bay Program final report.

Parker, R. H. (1960). *Ecology and distributional patterns of marine macro-invertebrates, northern Gulf of Mexico*. 302-337.

Wasel, S. and Albadran, B. (2003). Sedimentology and maniralogical of rocky island in Khor Al-Zubair, NW Arabian Gulf. *Marina Mesopotamica*, 18(1), 43-54.